

AGENDA

Forest Carbon Accounting Stakeholder Meeting Harvested Wood Products Workshop

April 22, 2019
1:00 – 4:00 pm

2600 State St, Salem, OR
Tillamook Room

Meeting Purpose:

- Update on progress of the Oregon Harvested Wood Product Carbon Report.
 - Introduction to the Harvested Wood Products model and output
 - Stakeholder discussion and input
-

Facilitator: Chad Davis, ODF

1:00—1:15 Introductions and Agenda Overview

1:15—2:50 Harvested Wood Products Carbon Model

- Brief review of HWP model and framework
- Explanation of Oregon Input data, collection process and references
- Timber and primary product ratios and end use ratios
- Graphical user interface and running the model
- Review of results and explanation of output
- Group exercise - Participants use the online HWP model:
 - Workshop attendees should bring a laptop for the exercise with the model. The laptop should have a USB port, WiFi, and a compatible browser: Internet Explorer, Chrome or Edge. **Google Chrome is preferred.** Firefox is NOT compatible. Apple/Mac/Safari – unknown!
 - Workshop hosts will provide a USB drive with sample data sets for the exercise.

3:00—4:00 Stakeholder questions and feedback

Please use the California Forest Ecosystems and Harvested Wood Products Carbon Report, Chapters 5 and 6 as reference for the application of the model to California wood products analysis and as a guide to the format of the output and results that will appear in the Oregon report.

Harvested Wood Product Carbon Storage Estimates for Oregon Forestlands 1962 - 2017



Dan Loeffler
Tom Donahue

ODF Harvested Wood Product Carbon Stakeholder Workshop, April 22, 2019

Photos courtesy of BBER

Harvested Wood Product Carbon Storage Estimates

Stockmann et al. Carbon Balance and Management 2012, 7:1
<http://www.cbjournal.com/content/7/1/1>



RESEARCH

Open Access

Estimates of carbon stored in harvested wood products from the United States forest service northern region, 1906-2010

Keith D Stockmann^{1*}, Nathaniel M Anderson², Kenneth E Skog³, Sean P Healey⁴, Dan R Loeffler⁵, Greg Jones² and James F Morrison¹

Abstract

Background: Global forests capture and store significant amounts of CO₂ through photosynthesis. When carbon is removed from forests through harvest, a portion of the harvested carbon is stored in wood products, often for many decades. The United States Forest Service (USFS) and other agencies are interested in accurately accounting for carbon flux associated with harvested wood products (HWP) to meet greenhouse gas monitoring commitments and climate change adaptation and mitigation objectives. This paper uses the Intergovernmental Panel on Climate Change (IPCC) production accounting approach and the California Forest Project Protocol (CFPP) to estimate HWP carbon storage from 1906 to 2010 for the USFS Northern Region, which includes forests in northern Idaho, Montana, South Dakota, and eastern Washington.

Results: Based on the IPCC approach, carbon stocks in the HWP pool were increasing at one million megagrams of carbon (MgC) per year in the mid 1960s, with peak cumulative storage of 28 million MgC occurring in 1995. Net positive flux into the HWP pool over this period is primarily attributable to high harvest levels in the mid twentieth century. Harvest levels declined after 1970, resulting in less carbon entering the HWP pool. Since 1995, emissions from HWP at solid waste disposal sites have exceeded additions from harvesting, resulting in a decline in the total amount of carbon stored in the HWP pool. The CFPP approach shows a similar trend, with 100-year average carbon storage for each annual Northern Region harvest peaking in 1969 at 937,900 MgC, and fluctuating between 84,000 and 150,000 MgC over the last decade.

Conclusions: The Northern Region HWP pool is now in a period of negative net annual stock change because the decay of products harvested between 1906 and 2010 exceeds additions of carbon to the HWP pool through harvest. However, total forest carbon includes both HWP and ecosystem carbon, which may have increased over the study period. Though our emphasis is on the Northern Region, we provide a framework by which the IPCC and CFPP methods can be applied broadly at sub-national scales to other regions, land management units, or firms.

Background

Recent estimates of net annual storage, or flux, indicate that the world's forests are an important carbon sink, removing more carbon from the atmosphere through photosynthesis than they emit through combustion and decay [1]. The forest sector of the United States (US) stored about 48,437 teragrams of carbon (TgC) in 2010

[2], or the equivalent of about 30 years of US fossil fuel emissions at the 2008 rate. The US Environmental Protection Agency (EPA) estimates that in 2010 net additions to ecosystem and harvested wood products (HWP) pools were 235 TgC yr⁻¹ [2]. Thus, US forests function as a carbon sink, annually offsetting about 15 percent of the country's carbon emissions from fossil fuel combustion.

About 5 percent of total US forest sector carbon stocks and 6 percent of the annual flux is attributable to carbon in HWP [2]. Though the HWP fraction of the

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Dan Loeffler

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James Morrison (retired)

Other notable contributors:

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Edward Butler

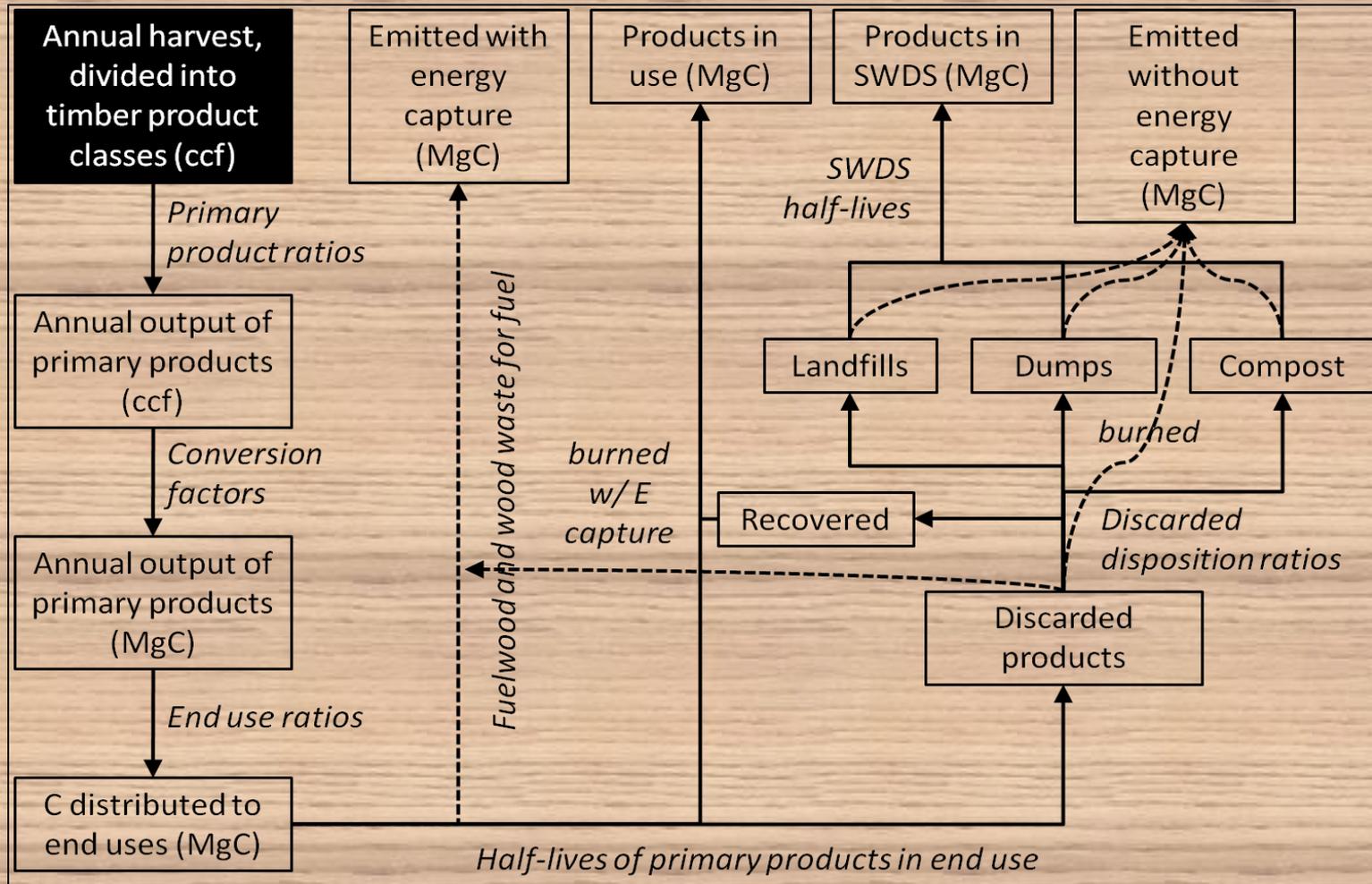
Presentation Outline

- The HWP framework
- Data and data sources
 - Yearly timber harvest data
 - Timber product ratios
 - Primary product ratios
 - End use ratios
- Results
 - Annual Oregon timber product output
 - Total Oregon carbon storage
 - Net change in carbon stocks

Presentation Outline

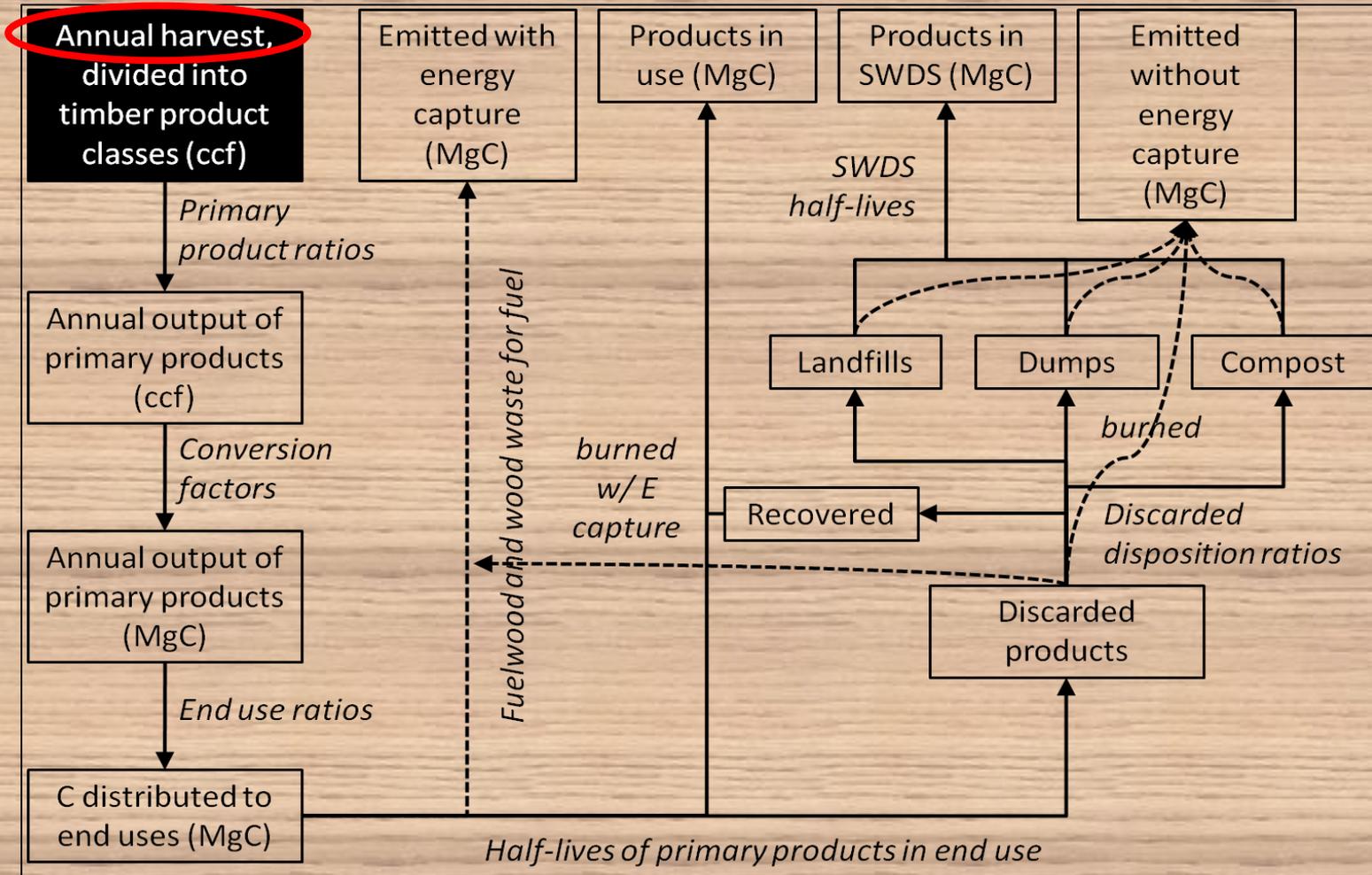
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The HWP framework

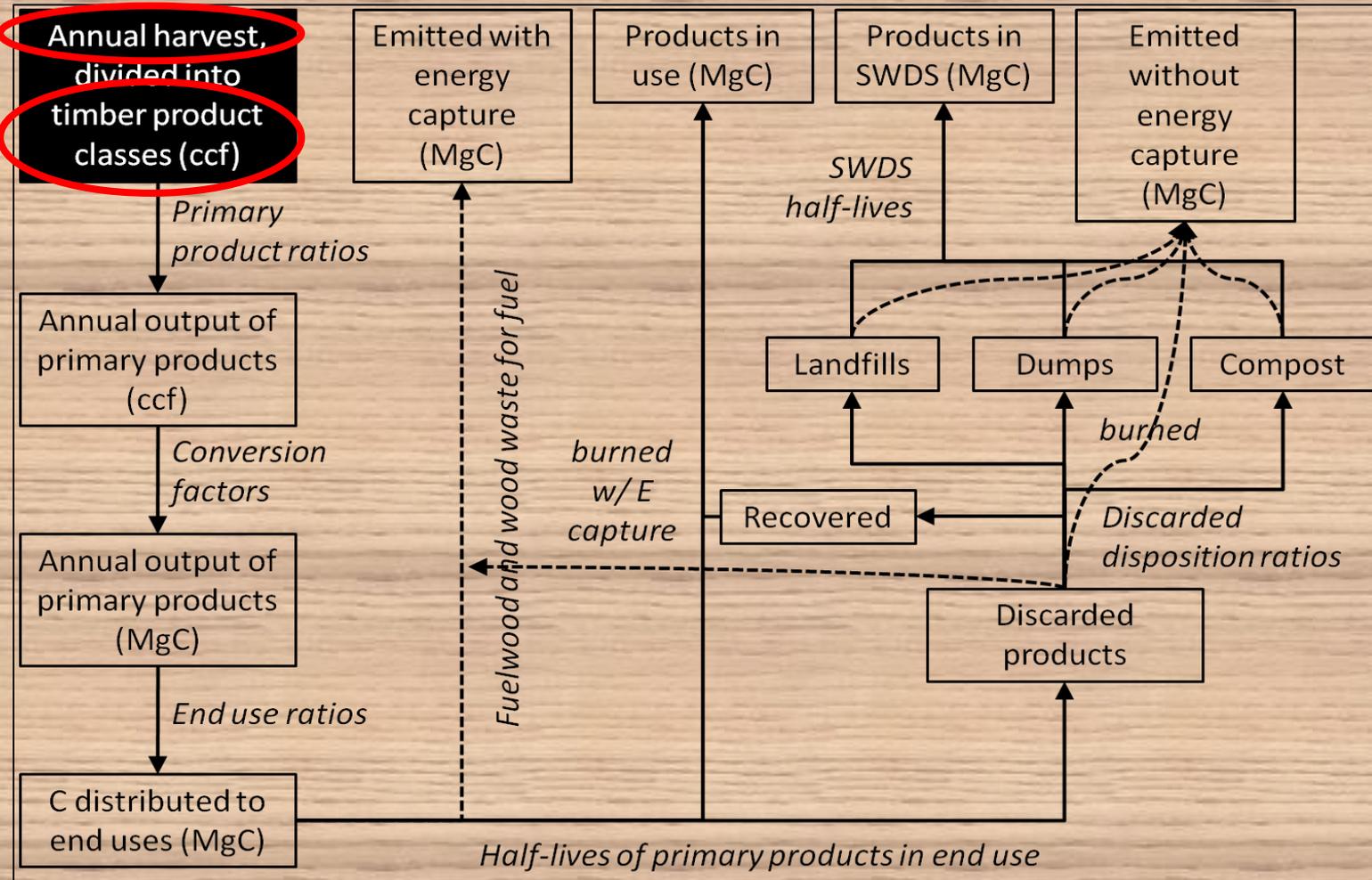


From Stockmann et al. 2012, Carbon Balance and Management 7:1.

The HWP framework

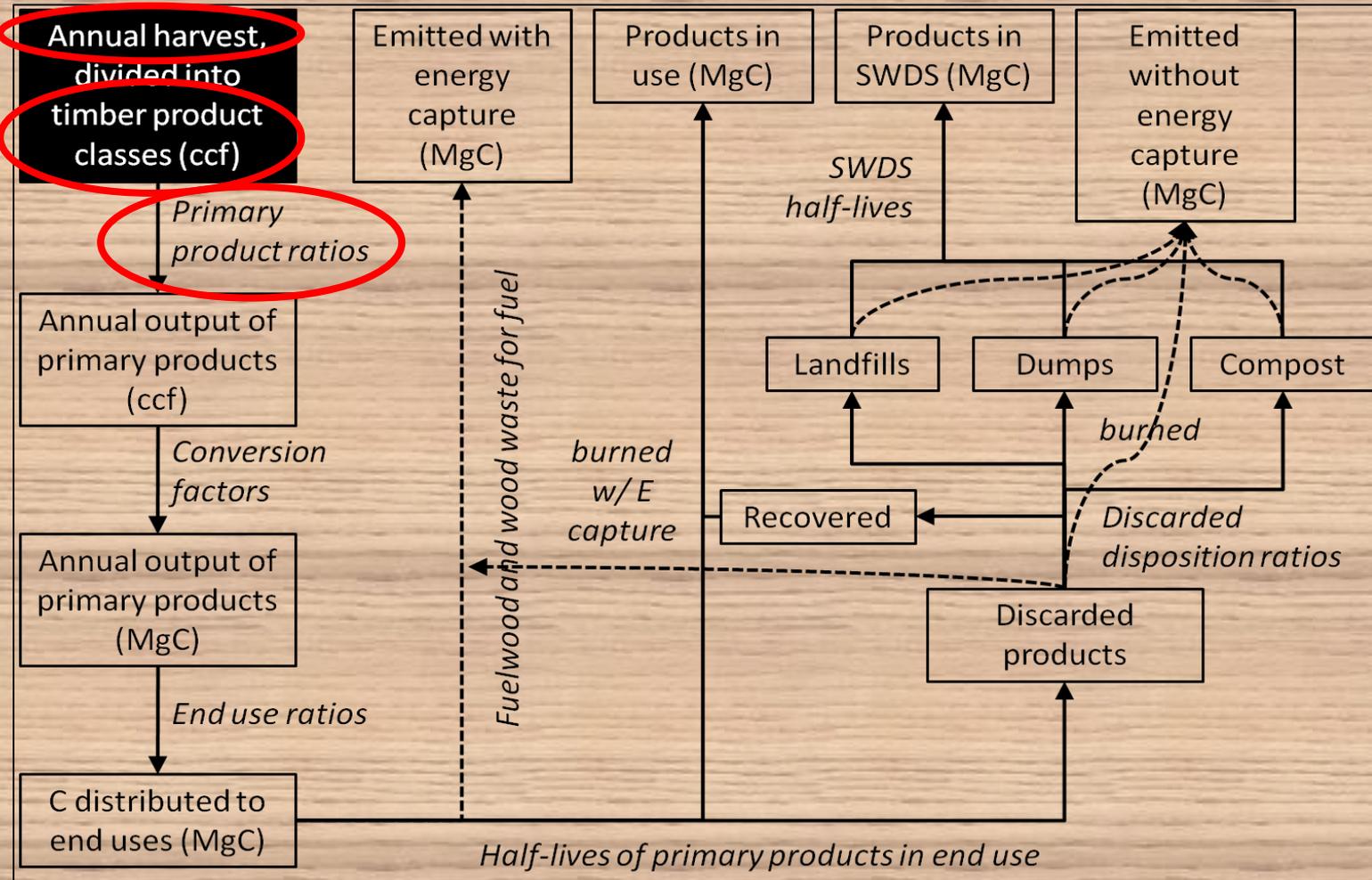


The HWP framework



From Stockmann et al. 2012, Carbon Balance and Management 7:1.

The HWP framework



From Stockmann et al. 2012, Carbon Balance and Management 7:1.

The HWP framework

Distributions

- Harvested timber
 - CCF
- Timber products
 - Softwood sawtimber, hardwood sawtimber, softwood poles, hardwood poles, softwood small roundwood, hardwood small roundwood, etc.
- Primary products
 - Softwood lumber, softwood plywood, mill residue pulp, mill residue fuel, mill residue non-structural panel, etc.
- End uses
 - New residential construction (single, multi family, mobile homes), new non-residential construction, manufacturing (household furniture, other furniture, other products), shipping, other uses

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Data and data sources *

- **Yearly harvest data, converted to CCF** (OR Dept. Forestry)
 - 1962 – 2017
 - Private (IP, NIP), State, Tribal, BLM, USFS, county and municipal
- **Yearly timber product ratios**
 - OSU, PNW, BBER FIDACS literature
- **Yearly primary product ratios** (OSU, PNW, BBER FIDACS)
 - 2013, 2008, 2003, 1998, 1994, 1992, 1988, 1985, 1982, 1976, 1972, 1968
- Wood to carbon estimates (Smith et al. GTR-343)
- Half-life data (Skog 2008)
- End use ratios (McKeever 2009)
- Fuelwood and wood waste emitted with energy capture
- Discarded products to landfills, dumps, compost (Skog 2008)

* **Bold font = user created data**; plain font = examples of data and parameters hard wired in the current HWP model

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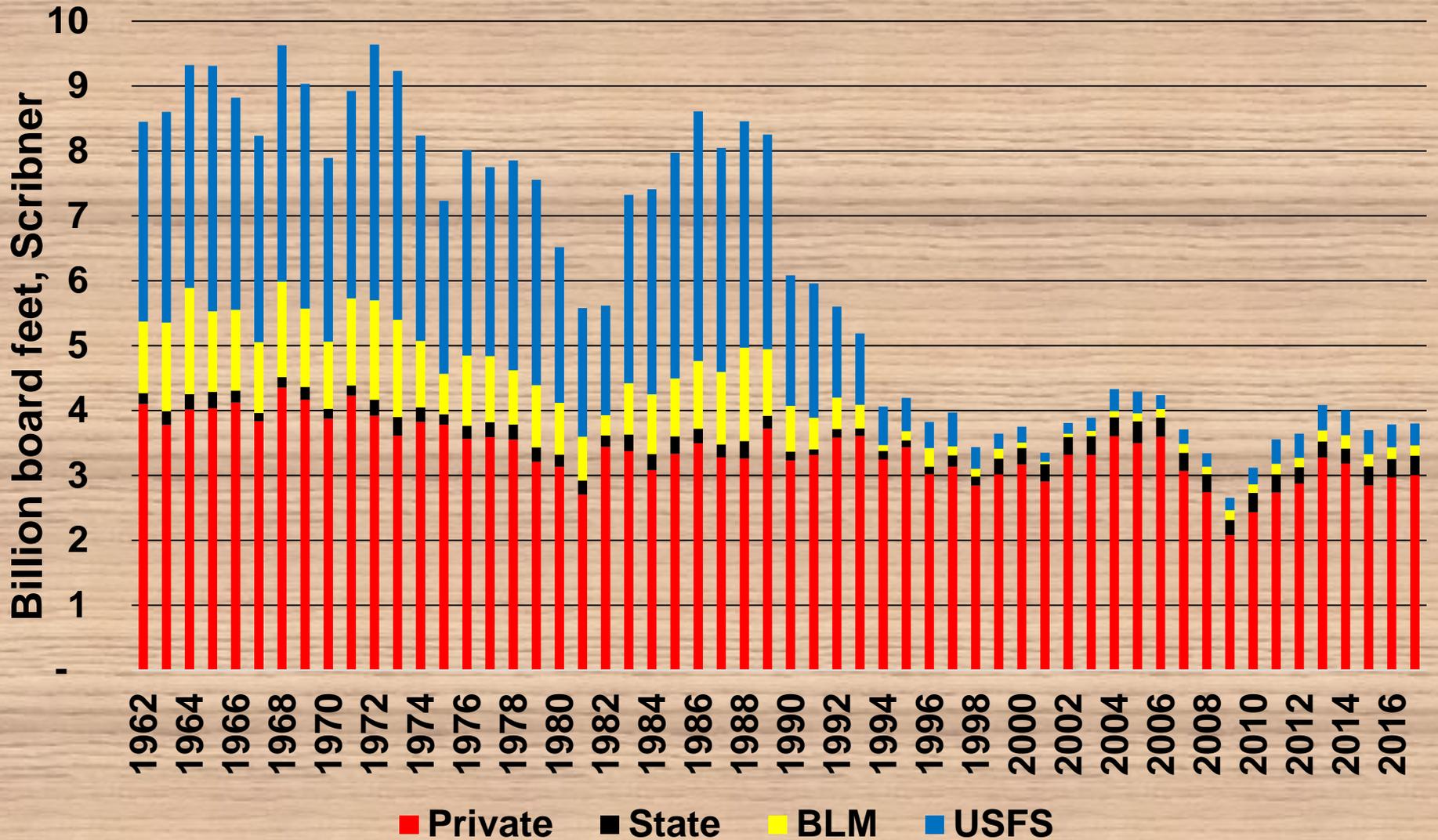
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Yearly harvest data



Yearly harvest data

Tabular harvest for selected years, converted from MBF to CCF

	A	B	C	D	E
1	Year	ccf			
2	2017	9588973			
3	2016	9681874			
4	2015	9432135			
5	2014	10273621			
6	2013	10455891			
7	2012	9334374			
8	2011	9086229			
9	2010	8034016			
10	2009	6843633			
11	2008	8230518			
12	2007	9084686			
13	2006	10350210			
14	2005	10550446			
15	2004	10645553			
16	2003	9838757			
17	2002	9643398			
18	2001	8456980			
19	2000	9474141			
20	1999	8262281			
21	1998	7762424			

Yearly harvest data

Board foot Scribner to cubic foot conversion

$$X \text{ MMBF}_{\text{Scribner}} * \frac{1,000,000 \text{ BF}}{\text{MMBF}} * \frac{1}{\text{convers. factor}} * \frac{\text{CCF}}{100 \text{ CF}} = Y \text{ CCF}$$

Where

MMBF = million board feet Scribner

CCF = hundred cubic feet

convers. factor = ratio of board feet per cubic feet (BF/CF), from:

- 1952 – 1979: **5.42** (Keegan et al. FPJ 2010 6(2))
- 1980 – 1989: **5.17** (Keegan et al. FPJ 2010 6(2))
- 1990 – 2000: **4.55** (Keegan et al. FPJ 2010 6(2))
- 2000 – 2003: **4.07** (Brandt et al. PNW GTR 681)
- 2004 – 2008: **4.18** (Gale et al. PNW GTR 868)
- 2009 – 2017: **4.02** (Simmons et al. PNW GTR 942)

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Timber product ratios

- **1962:** Newport. PNW-9
- **1968:** Manock et al. ODF, PNW (publish date unknown)
- **1972:** Schuldt, OSU (published 1974)
- **1976:** Howard and Hiserote. PNW-79
- **1982:** Howard. PNW-118.
- **1985:** Howard and Ward. PNW-RB-149
- **1988:** Howard and Franklin. PNW-RB-183
- **1992:** Ward. PNW-RB-207
- **1994:** Ward. PNW-RB-216
- **1998:** Ward et al. ODF, PNW (published 2000)
- **2003:** Brandt et al. PNW-GTR-681
- **2008:** Gale et al. PNW-GTR-868
- **2013:** Simmons et al. PNW-GTR-942
- **2014-2017:** ODF

Timber product ratios

- The model has 40 timber product classes, 20 classes each for softwood and hardwood
- Vary from year to year; yearly ratios need to sum to 1.00
- Examples of timber product classes include:
 - Hardwood sawtimber, softwood sawtimber, softwood poles, hardwood poles, hardwood pulpwood, softwood pulpwood, mine props, ties, float logs, miscellaneous convertible
- The most common categories found in the FIDACS literature are:
 - Lumber
 - Veneer and plywood
 - Export
 - Pulp and board
 - Post, pole, and piling
 - Shake and shingle

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Timber product category

Sawlog, hardwood and softwood

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Timber product category

Sawlog, hardwood and softwood

Pulpwood, hardwood and softwood

Poles, softwood

Miscellaneous convertible, softwood

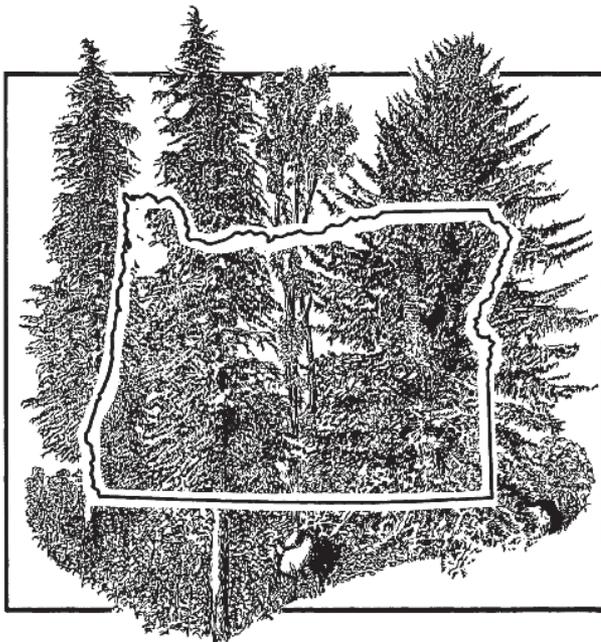
Timber product ratios



United States
Department of
Agriculture
Forest Service
Pacific Northwest
Forest and Range
Experiment Station
Resource Bulletin
PNW-118
October 1984

Oregon's Forest Products Industry: 1982

James O. Howard



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All Industries, Oregon

Table 9—Log consumption by mills, by species, resource area, and industry, Oregon, 1982

(THOUSAND BOARD FEET, SCRIBNER LOG RULE)

RESOURCE AREA AND INDUSTRY	ALL SPECIES	DOUGLAS-FIR	HEMLOCK	TILE FIRS	SPRUCE	PACIFIC PINE	LOGSPOLE PINE	WESTERN REDCEDAR	OTHER SOFTWOODS	RED ALDER	OTHER HARDWOODS
NORTHWEST											
LUMBER	646,319	421,341	160,328	18,468	2,092	170	36	26,283	533	11,922	4,374
VENEER AND PLYWOOD	249,397	163,165	46,063	3,408	25,255	4,712	56	476	72	2,172	3,481
PULP AND BOARD	72,069	15	48,488	300	22,953	..	..	..	..	11	..
SHAKE AND SHINGLE	2,370	..	..	..	..	..	..	..	..	..	..
EXPORT	308,792	193,286	87,808	13,993	3,773	112	..	..	..	622	898
POST, POLE, AND PILING	22,699	19,669	908	..	..	..	..	..	..	..	..
TOTAL	1,102,244	795,114	341,627	38,269	55,251	4,994	3,078	28,151	1,247	15,108	8,655
WEST-CENTRAL											
LUMBER	5,117	689,229	124,373	8,244	2,800	303	..	60,527	2,111	14,346	2,408
VENEER AND PLYWOOD	724,989	632,354	53,646	9,542	2,126	4,218	13,346	2,223	1,397	1,228	..
SHAKE AND SHINGLE	2,981	..	..	..	..	..	..	..	..	..	..
EXPORT	..	..	..	..	..	..	..	..	..	..	..
POST, POLE, AND PILING	3,793	3,793	..	..	..	..	..	..	..	..	..
TOTAL	1,442,838	1,327,388	180,041	17,787	4,626	4,521	15,346	71,281	3,508	15,704	2,408
SOUTHWEST											
LUMBER	273,393	283,310	22,923	28,315	280	127,895	4,115	22,126	70,896	312	129
VENEER AND PLYWOOD	618,215	483,315	22,923	3,022	..	..	..	..	..	..	..
PULP AND BOARD	4,837	..	..	..	..	..	..	..	..	..	..
SHAKE AND SHINGLE	1,118	..	..	..	..	..	..	..	..	..	..
EXPORT	189,377	147,335	25,741	..	..	..	..	..	..	..	..
TOTAL	1,817,873	1,298,579	145,871	103,261	3,278	128,329	5,045	24,402	99,912	5,056	3,340
CENTRAL											
LUMBER	466,406	40,707	2,208	14,859	237	333,664	54,152	..	15,489	..	..
VENEER AND PLYWOOD	211,883	84,108	3,493	103,219	2,316	3,803	4,658	..	10,286	..	..
SHAKE AND SHINGLE	..	..	..	..	..	..	..	..	..	..	..
EXPORT	..	..	..	..	..	..	..	..	..	..	..
POST, POLE, AND PILING	..	..	..	..	..	..	..	..	..	..	..
TOTAL	678,291	124,815	6,701	118,078	2,553	337,469	60,810	..	25,775	..	..
BLUE MOUNTAIN											
LUMBER	420,151	71,835	9,808	33,690	9,376	263,916	29,937	..	1,299	..	..
VENEER AND PLYWOOD	..	..	..	..	..	..	..	..	..	..	..
SHAKE AND SHINGLE	..	..	..	..	..	..	..	..	..	..	..
EXPORT	..	..	..	..	..	..	..	..	..	..	..
POST, POLE, AND PILING	..	..	..	..	..	..	..	..	..	..	..
TOTAL	420,151	71,835	9,808	33,690	9,376	263,916	29,937	..	1,299	..	..
ALL AREAS											
LUMBER	3,419,823	1,708,871	323,830	114,812	15,151	925,951	90,255	188,968	90,311	26,780	6,929
VENEER AND PLYWOOD	3,254,956	1,345,160	199,453	182,850	33,687	13,166	28,627	41,642	25,111	7,003	3,481
PULP AND BOARD	76,414	15	48,488	300	22,953	..	..	..	..	1,383	3,311
SHAKE AND SHINGLE	11,609	..	..	..	..	..	..	..	..	..	..
EXPORT	308,189	248,221	113,549	13,993	3,773	112	..	..	..	670	..
POST, POLE, AND PILING	38,464	34,944	908	..	..	..	..	..	..	..	..
TOTAL	5,940,299	3,337,351	686,228	311,185	75,564	956,229	114,416	128,814	131,741	35,846	13,831

1 Northwest and Southwest combined to avoid disclosure.
2 West-Central, Central, and Southwest combined to avoid disclosure.
3 Northwest, Central, and Blue Mountain combined to avoid disclosure.
4 Central and Blue Mountain combined to avoid disclosure.

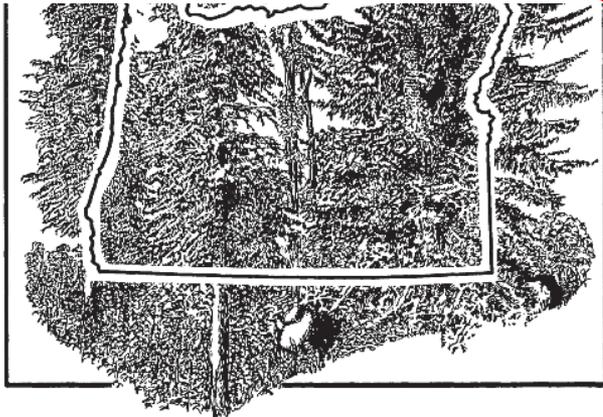
Timber product ratios

ALL AREAS:

LUMBER 3,410,855
 VENEER AND PLYWOOD 2,034,956
 PULP AND BOARD 76,654
 SHAKE AND SHINGLE 11,469
 EXPORT 398,169
 POST, POLE, AND PILING 28,494

TOTAL

5,960,597



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II Industries, Oregon

Table 9—Log consumption by mills, by species, resource area, and industry, Oregon, 1982

SOURCE AREA & INDUSTRY	(THOUSAND BOARD FEET, SCRIPPER LOG RULE)										
	ALL SPECIES	DOUGLAS-FIR	HEMLOCK	TILE FIRM	SPRUCE	POKEROSA PINE	LOGSPOLE PINE	WESTERN REDCEDAR	OTHER SOFTWOOD	RED ALDER	OTHER HARDWOODS
WYOMING											
LUMBER	646,319	421,341	160,328	18,468	2,092	170	36	26,283	533	11,922	4,374
VENEER AND PLYWOOD	249,797	163,165	44,063	3,468	28,293	**	50	476	72	2,272	3,481
PULP AND BOARD	72,063	15	48,488	**	300	22,953	**	**	**	11	**
SHAKE AND SHINGLE	2,270	**	**	**	**	**	**	2,370	**	**	**
EXPORT	308,792	193,286	87,808	13,993	3,773	112	**	**	622	898	**
POST, POLE, AND PILING	22,699	19,669	908	**	**	**	**	3,722	**	**	**
TOTAL	1,107,244	795,114	341,627	38,269	35,231	4,994	3,078	29,131	1,247	15,108	8,655
EST-CENTRAL											
LUMBER	5,117	689,229	124,373	8,244	2,800	309	**	60,527	2,111	14,346	2,408
VENEER AND PLYWOOD	724,989	632,364	23,646	9,542	2,126	4,218	13,346	2,223	1,397	1,228	**
PULP AND BOARD	2,981	**	**	**	**	**	**	2,981	**	**	**
SHAKE AND SHINGLE	**	**	**	**	**	**	**	**	**	**	**
EXPORT	**	**	**	**	**	**	**	**	**	**	**
POST, POLE, AND PILING	3,793	3,793	**	**	**	**	**	**	**	**	**
TOTAL	1,442,838	1,327,388	180,041	17,787	4,626	4,521	15,346	71,281	3,508	15,704	2,426
SOUTHWEST											
LUMBER	273,393	683,710	23,993	28,315	280	127,895	4,115	22,126	70,896	312	129
VENEER AND PLYWOOD	648,215	483,215	22,223	3,022	**	**	433	912	11,812	3,262	**
PULP AND BOARD	4,817	**	**	**	**	**	**	**	**	**	**
SHAKE AND SHINGLE	1,118	**	**	**	**	**	**	350	388	1,376	3,211
EXPORT	189,377	147,335	25,741	**	**	**	**	392	603	15,196	**
TOTAL	1,811,873	1,298,579	145,871	103,261	3,278	128,329	5,045	24,402	99,912	1,856	3,340
INTERNAL											
LUMBER	666,406	40,707	2,288	14,839	237	333,664	56,153	**	15,489	**	**
VENEER AND PLYWOOD	211,883	84,108	3,493	103,219	3,316	3,803	4,658	**	10,286	**	**
SHAKE AND SHINGLE	**	**	**	**	**	**	**	**	**	**	**
EXPORT	**	**	**	**	**	**	**	**	**	**	**
POST, POLE, AND PILING	**	**	**	**	**	**	**	**	**	**	**
TOTAL	878,291	124,815	6,791	118,078	2,553	337,469	60,810	**	25,775	**	**
BLUE MOUNTAIN											
LUMBER	420,121	71,825	9,898	33,690	9,576	263,918	29,937	**	1,299	**	**
VENEER AND PLYWOOD	**	**	**	**	**	**	**	**	**	**	**
PULP AND BOARD	**	**	**	**	**	**	**	**	**	**	**
SHAKE AND SHINGLE	**	**	**	**	**	**	**	**	**	**	**
EXPORT	**	**	**	**	**	**	**	**	**	**	**
POST, POLE, AND PILING	**	**	**	**	**	**	**	**	**	**	**
TOTAL	420,121	71,825	9,898	33,690	9,576	263,918	29,937	**	1,299	**	**
ALL AREAS											
LUMBER	3,410,855	1,708,871	323,830	114,812	15,151	925,951	90,255	188,968	90,311	26,780	6,929
VENEER AND PLYWOOD	2,034,956	1,345,169	199,453	182,880	33,687	13,166	29,627	41,642	25,111	7,005	3,681
PULP AND BOARD	76,654	15	48,488	300	22,953	**	500	**	**	1,383	3,211
SHAKE AND SHINGLE	11,469	**	**	**	**	**	**	11,081	**	**	**
EXPORT	398,169	248,221	113,549	13,993	3,773	112	302	603	15,188	898	**
POST, POLE, AND PILING	28,494	28,494	**	**	**	**	**	3,722	**	**	**
TOTAL	5,960,597	3,335,751	686,228	311,185	75,564	959,229	114,416	128,814	131,717	35,846	13,831

1. Central and Southwest combined to avoid disclosure.
 2. Central, Central, and Central combined to avoid disclosure.
 3. Central, Central, and Blue Mountain combined to avoid disclosure.
 4. Central and Blue Mountain combined to avoid disclosure.

Timber product ratios

Selected results for selected years:

A	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Timber Product ID	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993
1	0.0249	0.0249	0.0337	0.0337	0.0337	0.0337	0.0337	0.0341	0.0341	0.0341	0.0341	0.0165	0.0165
2	0.8735	0.8735	0.8757	0.8757	0.8757	0.8757	0.8757	0.8583	0.8583	0.8583	0.8583	0.9544	0.9544
3	0.0172	0.0172	0.0279	0.0279	0.0279	0.0279	0.0279	0.0419	0.0419	0.0419	0.0419	0.003	0.003
4	0.0772	0.0772	0.0458	0.0458	0.0458	0.0458	0.0458	0.0617	0.0617	0.0617	0.0617	0.0179	0.0179
5	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0.0027	0.0027	0.0019	0.0019	0.0019	0.0019	0.0019	0.0038	0.0038	0.0038	0.0038	0.007	0.007
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0.0004	0.0004	0.0004	0.0004	0.0004	0	0	0	0	0	0
14	0	0	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	0	0	0

Timber product ratios

Selected results for selected years:

A	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Timber Product ID	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993
1	0.0249	0.0249	0.0337	0.0337	0.0337	0.0337	0.0337	0.0341	0.0341	0.0341	0.0341	0.0165	0.0165
2	0.8735	0.8735	0.8757	0.8757	0.8757	0.8757	0.8757	0.8583	0.8583	0.8583	0.8583	0.9544	0.9544
3	0.0172	0.0172	0.0279	0.0279	0.0279	0.0279	0.0279	0.0419	0.0419	0.0419	0.0419	0.003	0.003
4	0.0772	0.0772	0.0458	0.0458	0.0458	0.0458	0.0458	0.0617	0.0617	0.0617	0.0617	0.0179	0.0179
5	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0.0027	0.0027	0.0019	0.0019	0.0019	0.0019	0.0019	0.0038	0.0038	0.0038	0.0038	0.007	0.007
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0.0004	0.0004	0.0004	0.0004	0.0004	0	0	0	0	0	0
14	0	0	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	0	0	0

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 - **Primary product ratios**
 - End use ratios
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 - Total Oregon carbon storage
 - Net change in carbon stocks

Primary product ratios

- Annual volumes of output for specific timber product classes (e.g. softwood sawlogs) distributed to specific primary products
- The model has 64 primary product classes, 32 classes each for softwood and hardwood
- Also vary from year to year
- Examples of primary product classes include:
 - Hardwood lumber, softwood lumber, softwood poles, hardwood wood pulp, softwood wood pulp
- Example of a timber product distributed to primary products:

Timber product

Softwood sawtimber

Primary product

Fuelwood and other
Lumber

Non-structural panels

Oriented strand board

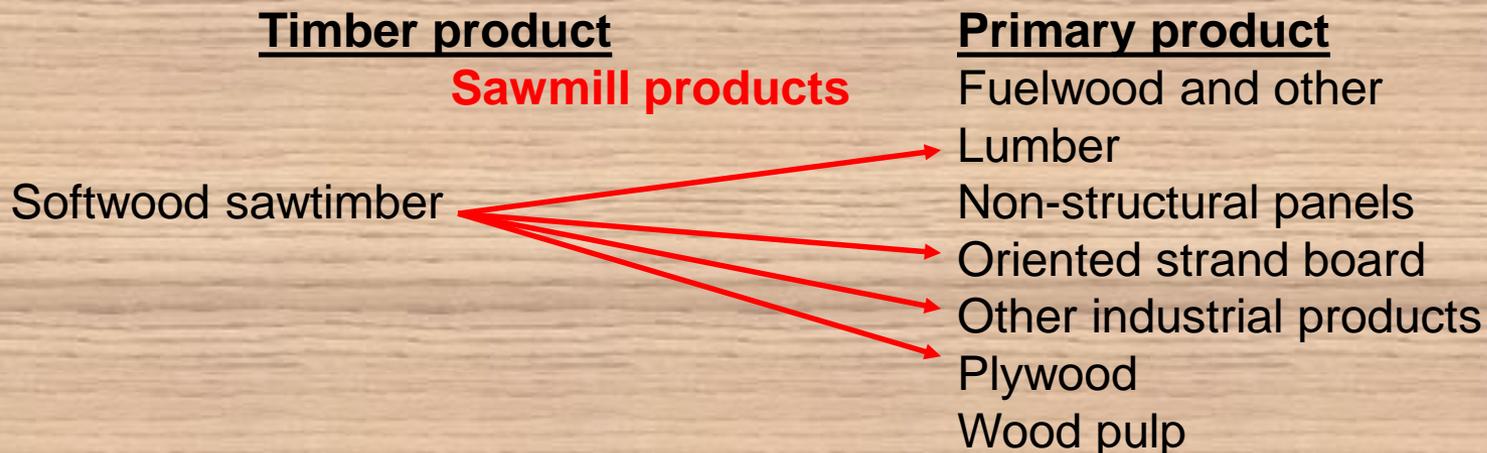
Other industrial products

Plywood

Wood pulp

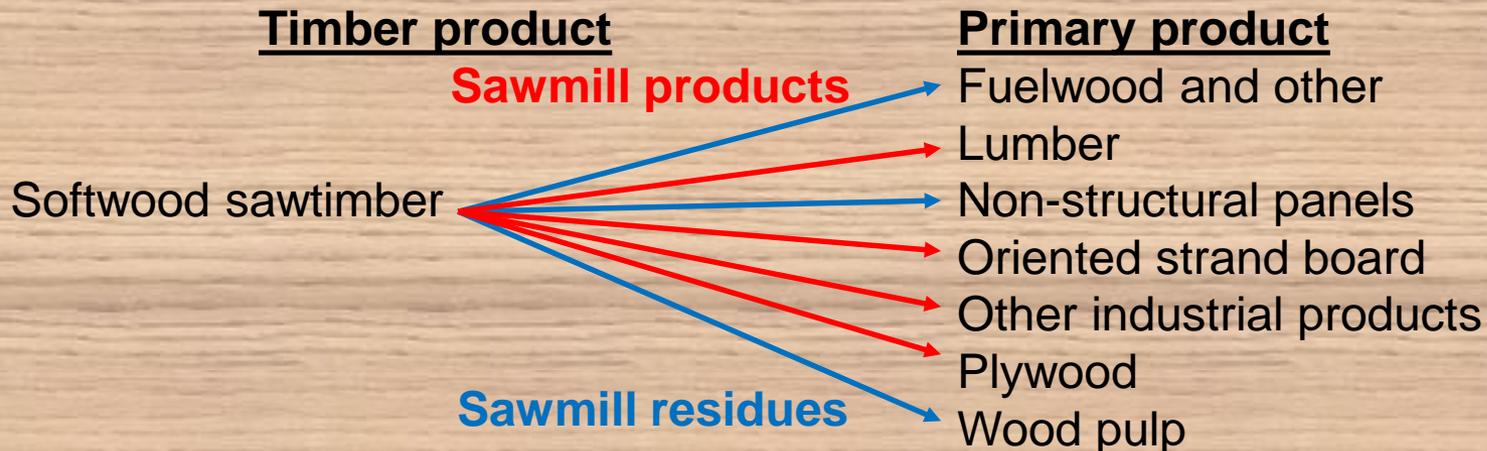
Primary product ratios

- Annual volumes of output for specific timber product classes (e.g. softwood sawlogs) distributed to specific primary products
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- Example of a timber product distributed to primary products:



Primary product ratios

- Annual volumes of output for specific timber product classes (e.g. softwood sawlogs) distributed to specific primary products
- The model has 64 primary product classes, 32 classes each for softwood and hardwood
- Also vary from year to year
- Examples of primary product classes include:
 - Hardwood lumber, softwood lumber, softwood poles, hardwood wood pulp, softwood wood pulp
- Example of a timber product distributed to primary products:



Primary product ratios

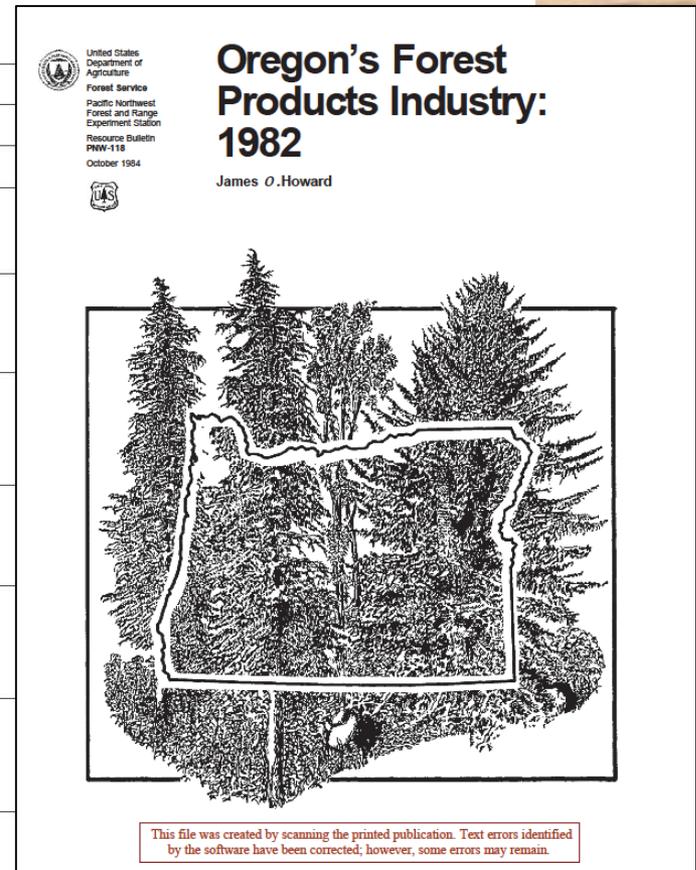
Sawmills, Oregon

Table 28—Production and disposition of wood residue by sawmills, by type of residue, use, resource area, and mill-size class, Oregon, 1982

(TONS, DRY WEIGHT)

RESOURCE AREA AND MILL-SIZE CLASS 1/	ALL TYPES OF RESIDUE							UNUSED	TOTAL	TOTAL
	TOTAL	TOTAL	PULP	BOARD	FUEL	MISCELLANEOUS	TOTAL			
NORTHWEST:										
D	16,116	16,095	8,619	4	3,624	3,848	21	10,771	10,771	
C	52,953	52,953	25,824	12,805	13,980	344	--	33,022	33,022	
B	153,064	153,064	75,884	23,424	42,151	11,805	--	89,191	89,191	
A	607,750	604,944	348,221	158,911	66,670	31,142	2,806	349,943	347,137	
TOTAL	829,883	827,056	458,348	195,144	126,425	47,139	2,827	482,927	480,121	
EST-CENTRAL: D AND C 4/										
D	121,879	121,879	64,760	15,380	40,861	1,078	--	71,333	71,333	
C	180,864	180,806	131,082	39,586	7,517	2,411	58	104,911	104,853	
B	880,853	880,853	529,869	189,521	154,937	6,726	--	511,350	511,350	
A										
TOTAL	1,183,396	1,183,338	725,521	244,487	203,115	10,215	58	687,594	687,536	
SOUTHWEST:										
D	3,159	2,988	1,688	--	897	163	170	2,245	2,123	
C	43,217	43,217	24,705	12,154	6,358	--	--	24,457	24,457	
B	170,418	170,418	34,638	46,188	89,583	--	--	97,183	97,183	
A	750,305	750,305	403,589	189,041	149,970	7,705	--	425,589	425,589	
TOTAL	967,098	966,928	484,818	247,384	246,858	7,868	170	549,484	549,362	
CENTRAL: D AND C 4/										
D	57,523	53,829	9,873	5,957	29,624	8,475	3,684	31,481	30,746	
C	163,502	162,712	62,809	14,442	83,585	11,886	790	98,685	96,231	
B	505,521	505,521	103,822	169,879	221,174	10,846	--	271,336	271,336	
A										
TOTAL	746,546	742,062	176,504	189,978	344,383	31,187	4,484	401,462	400,313	
BLUE MOUNTAIN:										
D	4,678	2,801	--	--	1,855	946	1,877	2,942	1,888	
C	63,769	63,691	20,808	18,216	24,867	--	78	37,358	37,358	
B	70,855	70,855	39,675	5,280	25,900	--	--	37,720	37,720	
A	355,033	355,033	87,933	59,416	207,684	--	--	181,662	181,662	
TOTAL	494,335	492,380	148,216	82,912	280,306	946	1,955	259,883	258,609	
ALL AREAS:										
D	23,952	21,884	10,507	4	6,416	4,957	2,068	-15,958	14,762	
C	339,341	335,569	145,770	64,412	115,490	9,897	3,772	197,632	196,917	
B	758,503	757,655	343,896	128,921	258,756	26,082	848	427,870	427,178	
A	3,099,462	3,096,656	1,732,234	766,588	800,433	58,419	2,806	1,739,890	1,737,084	
TOTAL	4,221,258	4,211,644	1,973,407	959,905	1,181,087	97,355	9,494	2,381,150	2,375,941	

See footnotes at end of table.



This file was created by scanning the printed publication. Text errors identified by the software have been corrected; however, some errors may remain.

Primary product ratios

Selected results for selected years:

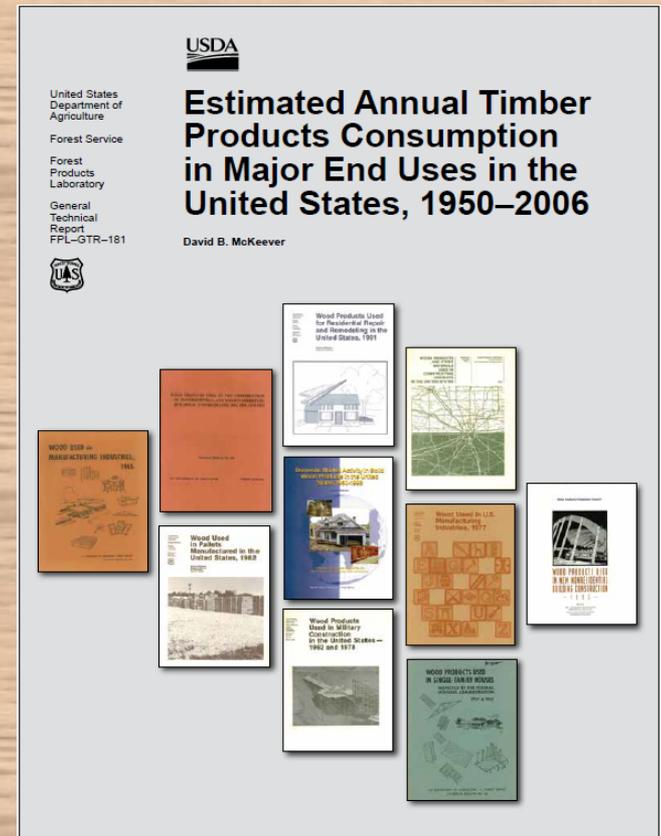
A	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
Primary Product ID	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974
13	0.1285	0.1285	0.1458	0.1458	0.1458	0.142	0.142	0.142	0.1641	0.1641	0.1641	0.1641	0.1641	0.1641	0.1634	0.1634	0.1634
14	0.3182	0.3182	0.2911	0.2911	0.2911	0.248	0.248	0.248	0.2522	0.2522	0.2522	0.2522	0.2522	0.2522	0.3122	0.3122	0.3122
15	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0.2086	0.2086	0.1677	0.1677	0.1677	0.2177	0.2177	0.2177	0.2437	0.2437	0.2437	0.2437	0.2437	0.2437	0.1739	0.1739	0.1739
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0.6489	0.6489	0.6898	0.6898	0.6898	0.6398	0.6398	0.6398	0.6138	0.6138	0.6138	0.6138	0.6138	0.6138	0.6836	0.6836	0.6836
22	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334	0.1334
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0.2086	0.2086	0.1677	0.1677	0.1677	0.2177	0.2177	0.2177	0.2437	0.2437	0.2437	0.2437	0.2437	0.2437	0.1739	0.1739	0.1739
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091	0.0091
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0.6489	0.6489	0.6898	0.6898	0.6898	0.6398	0.6398	0.6398	0.6138	0.6138	0.6138	0.6138	0.6138	0.6138	0.6836	0.6836	0.6836

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End use ratios

- McKeever, David B. 2009. FPL-GTR-181
- 224 primary product end uses:
 - 47 each for hardwood and softwood sawtimber
 - 47 each for hardwood and softwood pulpwood
 - 36 for all other primary products



End use ratios

- McKeever, David B. 2009. FPL-GTR-181
- Selected results for selected years

TimberProduct	PrimaryProduct	EndUseProduct	2000	1999	1998	1997	1996	1995
hardwood, sawtimber	fuelwood and other	fuelwood and other	1	1	1	1	1	1
hardwood, sawtimber	lumber	manufacturing, other manufacturing	0.099	0.098	0.0984	0.1021	0.1019	0.1018
hardwood, sawtimber	lumber	rail and railcar, n/a	0	0	0	0	0	0
hardwood, sawtimber	lumber	packaging and shipping, n/a	0.3722	0.3645	0.3599	0.3705	0.3535	0.3818
hardwood, sawtimber	lumber	manufacturing, furniture	0.2426	0.2604	0.2744	0.2595	0.2738	0.2642
hardwood, sawtimber	lumber	other, n/a	0.0709	0.0668	0.06	0.0617	0.06	0.06
hardwood, sawtimber	lumber	new nonresidential, other	0.0684	0.0644	0.0635	0.065	0.0669	0.0712
hardwood, sawtimber	lumber	new nonresidential, new nonres buildings	0.0368	0.0347	0.0361	0.0333	0.0315	0.0289
hardwood, sawtimber	lumber	residential r and r, n/a	0.0463	0.0439	0.0419	0.0462	0.0492	0.0484

TimberProduct	PrimaryProduct	EndUseProduct	1974	1973	1972	1971	1970	1969
softwood, pulpwood	non-structural panels	new nonresidential, other	0.0071	0.0055	0.0051	0.0057	0.0066	0.0065
softwood, pulpwood	non-structural panels	residential r and r, n/a	0.118	0.0932	0.0931	0.1049	0.1235	0.112
softwood, pulpwood	non-structural panels	new housing, multifamily	0.0315	0.0553	0.0659	0.0663	0.0573	0.064
softwood, pulpwood	non-structural panels	rail and railcar, n/a	0	0	0	0	0	0
softwood, pulpwood	non-structural panels	new housing, manufactured housing	0.0698	0.0912	0.076	0.0711	0.0636	0.0561
softwood, pulpwood	oriented strandboard (OSB)	manufacturing, furniture	0	0	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	manufacturing, other manufacturing	0	0	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new nonresidential, other	0.0622	0.0464	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new housing, single family	0.4248	0.4594	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new housing, multifamily	0.0943	0.1656	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new housing, manufactured housing	0.0329	0.05	0	0	0	0

End use ratios

- McKeever, David B. 2009. FPL-GTR-181
- Selected results for selected years

TimberProduct	PrimaryProduct	EndUseProduct	2000	1999	1998	1997	1996	1995
hardwood, sawtimber	fuelwood and other	fuelwood and other	1	1	1	1	1	1
hardwood, sawtimber	lumber	manufacturing, other manufacturing	0.099	0.098	0.0984	0.1021	0.1019	0.1018
hardwood, sawtimber	lumber	rail and railcar, n/a	0	0	0	0	0	0
hardwood, sawtimber	lumber	packaging and shipping, n/a	0.3722	0.3645	0.3599	0.3705	0.3535	0.3818
hardwood, sawtimber	lumber	manufacturing, furniture	0.2426	0.2604	0.2744	0.2595	0.2738	0.2642
hardwood, sawtimber	lumber	other, n/a	0.0709	0.0668	0.06	0.0617	0.06	0.06
hardwood, sawtimber	lumber	new nonresidential, other	0.0684	0.0644	0.0635	0.065	0.0669	0.0712
hardwood, sawtimber	lumber	new nonresidential, new nonres buildings	0.0368	0.0347	0.0361	0.0333	0.0315	0.0289
hardwood, sawtimber	lumber	residential r and r, n/a	0.0463	0.0439	0.0419	0.0462	0.0492	0.0484

TimberProduct	PrimaryProduct	EndUseProduct	1974	1973	1972	1971	1970	1969
softwood, pulpwood	non-structural panels	new nonresidential, other	0.0071	0.0055	0.0051	0.0057	0.0066	0.0065
softwood, pulpwood	non-structural panels	residential r and r, n/a	0.118	0.0932	0.0931	0.1049	0.1235	0.112
softwood, pulpwood	non-structural panels	new housing, multifamily	0.0315	0.0553	0.0659	0.0663	0.0573	0.064
softwood, pulpwood	non-structural panels	rail and railcar, n/a	0	0	0	0	0	0
softwood, pulpwood	non-structural panels	new housing, manufactured housing	0.0698	0.0912	0.076	0.0711	0.0636	0.0561
softwood, pulpwood	oriented strandboard (OSB)	manufacturing, furniture	0	0	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	manufacturing, other manufacturing	0	0	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new nonresidential, other	0.0622	0.0464	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new housing, single family	0.4248	0.4594	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new housing, multifamily	0.0943	0.1656	0	0	0	0
softwood, pulpwood	oriented strandboard (OSB)	new housing, manufactured housing	0.0329	0.05	0	0	0	0

Running the HWP model

[Home](#) [About](#) [Advanced](#) [Contact](#)

Harvested Wood Products

Configure a simulation.

Download an Excel macro-enabled workbook that will help create the input data files [here](#). Use the HWP Ribbon to export data in the correct format for this tool or to add a new year. Do NOT change the basic format of any of the worksheets.

Steps:

- 1 Upload yearly harvest data**
 No file chosen
- 2 Upload yearly timber product ratios**
 No file chosen
- 3 Upload yearly primary product ratios or choose region for default ratios**
See a map of the regions [here](#).
 or No file chosen
- 4 Upload distribution parameters (optional and rarely used)**
 No file chosen
- 5 Upload ratios for burned with energy capture (optional and rarely used)**
 No file chosen
- 6 Enter number of iterations**
Any number larger than 1 will result in Monte Carlo simulation and the only output will be a table of confidence intervals around carbon storage for each year.
 Address to send email when done with Monte Carlo:
- 7 Run the model**

<http://maps.gis.usu.edu/HWP>

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Annual Timber Product Output

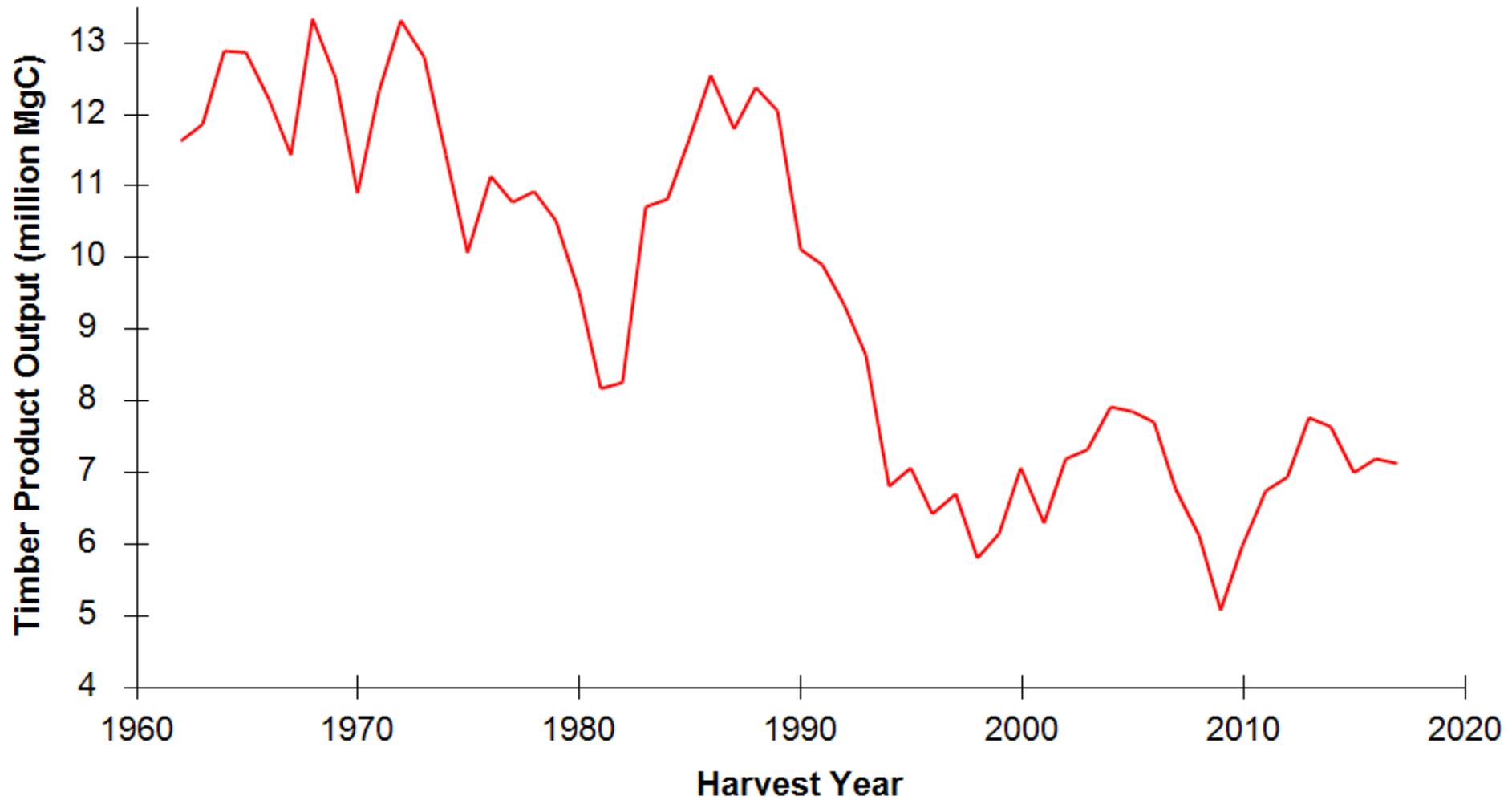


Figure 1. Annual timber product output in Oregon, converted to MgC, 1962 to 2017.

Total Carbon Storage

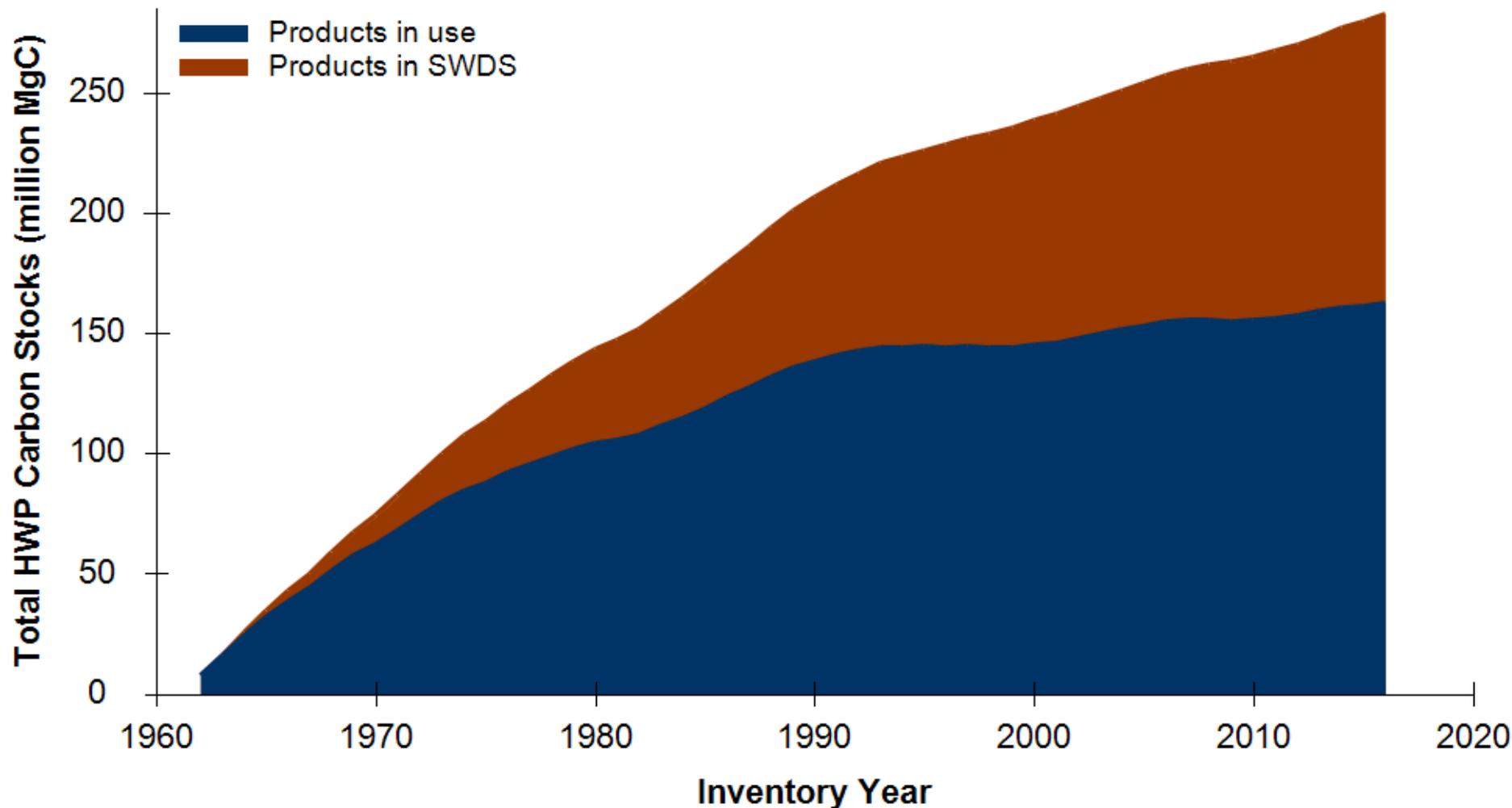


Figure 2. Cumulative total carbon stored in HWP manufactured from timber harvested from Oregon forests 1962 to 2017. Carbon in HWP includes both products that are still in use and carbon stored at solid waste disposal sites.

Net Change in Carbon Stocks

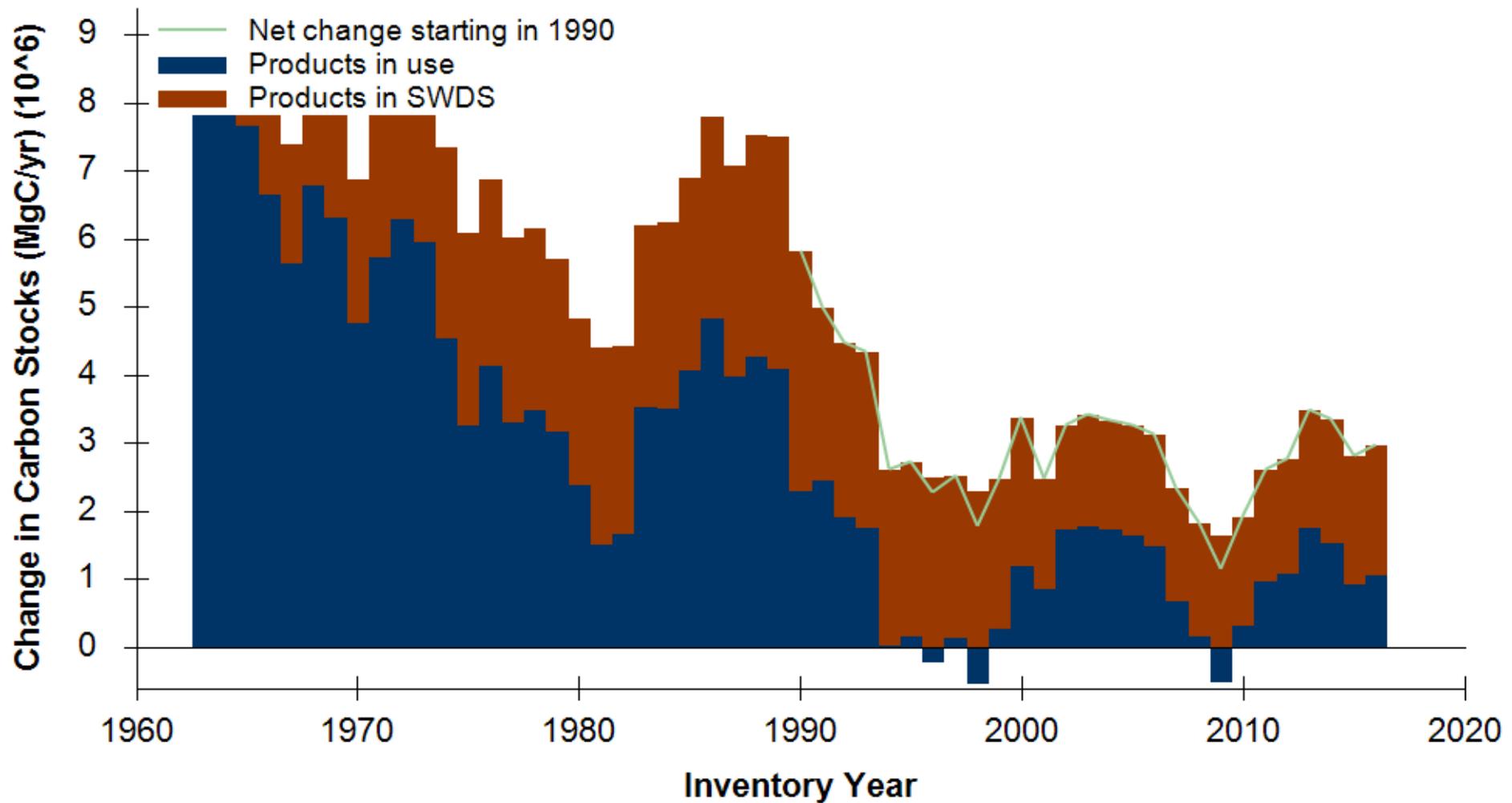


Figure 3. The net change in Oregon timber carbon stocks in HWP from the previous year. The net stock change is the sum of net change for SWDS (red bar) and products in use (blue bar).

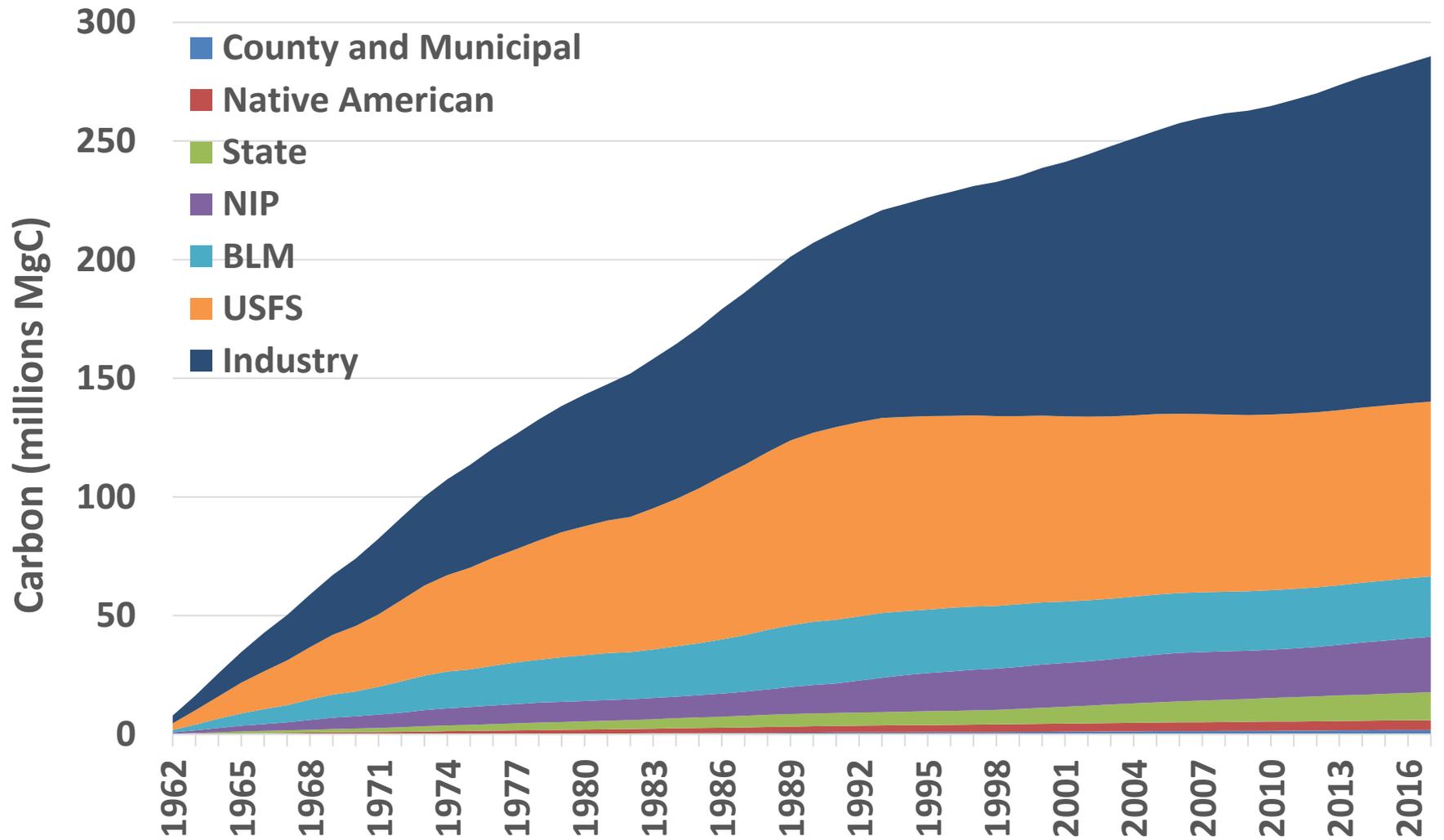


Figure 4. All ownership HWP C disposition of products in use and in SWDS

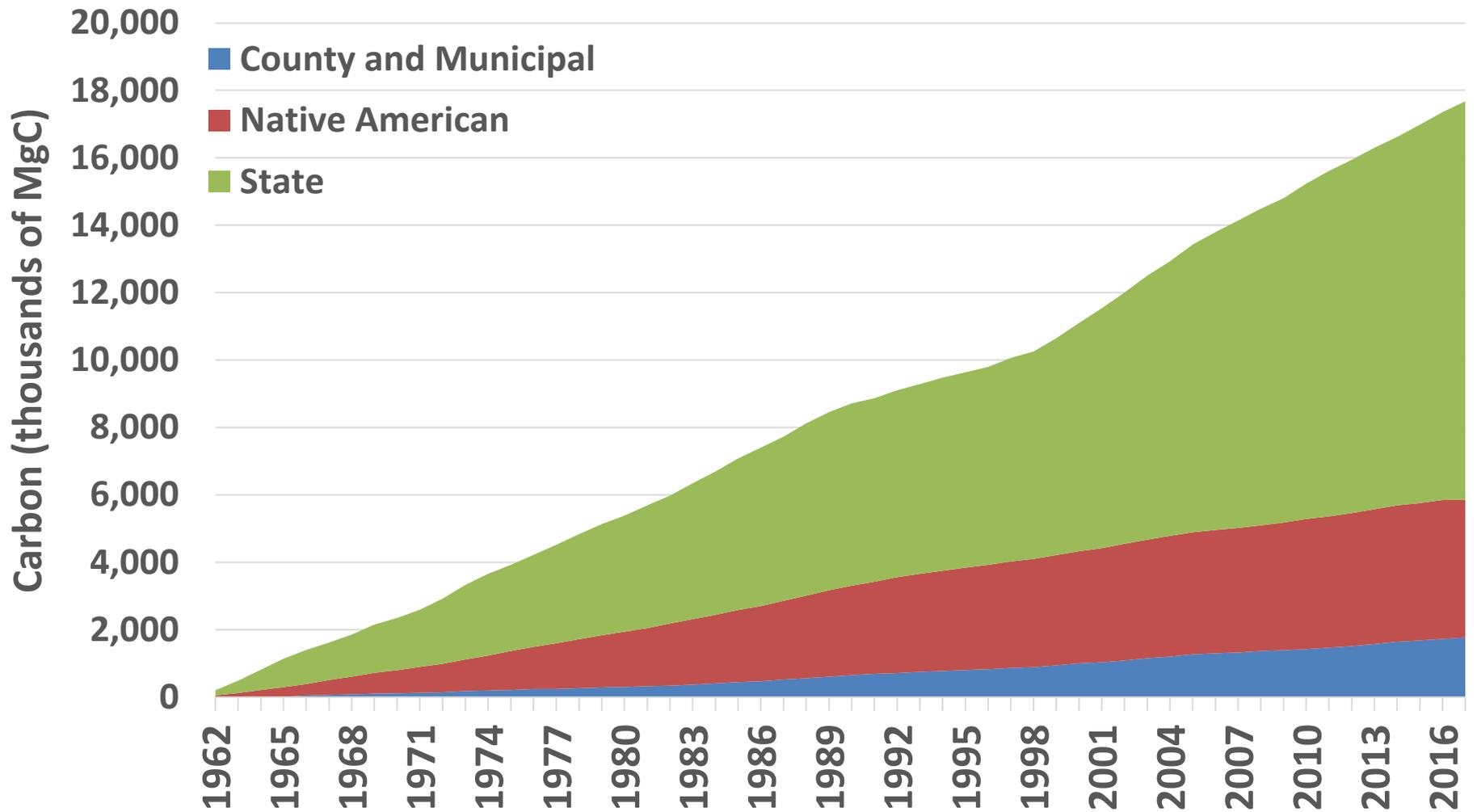
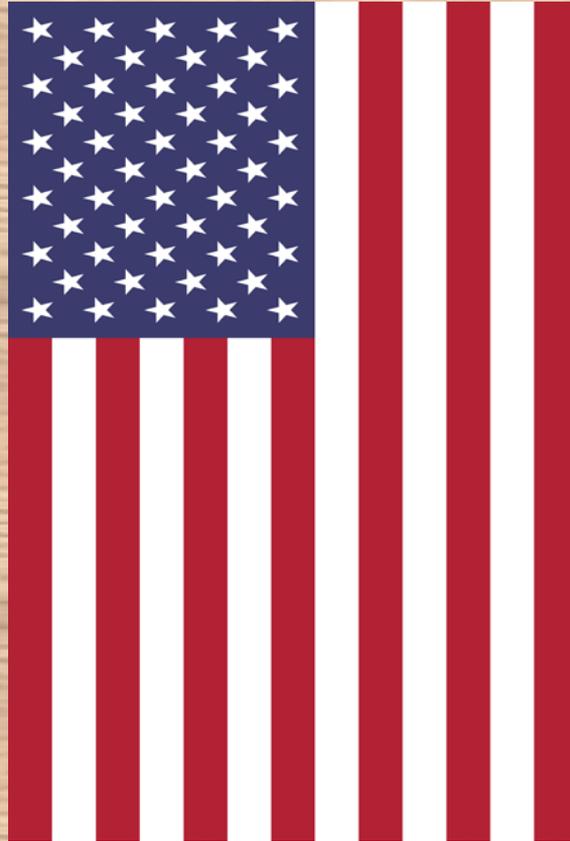


Figure 5. State, Tribal, County and Municipal ownership HWP C disposition of products in use and in SWDS

Thank you



Contact Dan Loeffler: dan.loeffler@mso.umt.edu